

Reproduction

Polar bears are characterized by late sexual maturity, small litter sizes, and extended parental investment in raising young, all factors that contribute to a low reproductive rate (Amstrup 2003, pp. 599–600). Reproduction in the female polar bear is similar to that in other ursids. Females generally mature and breed for the first time at 4 or 5 years and give birth at 5 or 6 years of age. Litters of two cubs are most common, but litters of three cubs are seen sporadically across the Arctic (Amstrup 2003, p. 599). When foraging conditions are difficult, polar bears may “defer” reproduction in favor of survival (Derocher et al. 1992, p. 564).

Polar bears enter a prolonged estrus between March and June, when breeding occurs. Ovulation is induced by mating (Wimsatt 1963, p. 72), and implantation is delayed until autumn. The total gestation period is 195 to 265 days (Uspenski 1977, cited in Amstrup 2003, p. 599), although active development of the fetus is suspended during most of this period. The timing of implantation, and therefore the timing of birth, is likely dependent on body condition of the female, which depends on a variety of environmental factors. Pregnant females that spend the late summer on land prior to denning may not feed for 8 months (Watts and Hansen 1987, p. 627). This may be the longest period of food deprivation of any mammal, and it occurs at a time when the female gives birth to and then nourishes new cubs.

Newborn polar bears are helpless and have hair, but are blind and weigh only 0.6 kg (1.3 lb) (Blix and Lentfer 1979, p. 68). Cubs grow rapidly, and may weigh 10 to 12 kg (22 to 26 lbs) by the time they emerge from the den in the spring. Young bears will stay with their mothers until weaning, which occurs most commonly in early spring when the cubs are 2.3 years of age. Female polar bears are available to breed again after their cubs are weaned; thus the reproductive interval for polar bears is 3 years.

Polar bears are long-lived mammals not generally susceptible to disease, parasites, or injury. The oldest known female in the wild was 32 years of age and the oldest known male was 28, though few polar bears in the wild live to be older than 20 years (Stirling 1988, p. 139; Stirling 1990, p. 225). Due to extremely low reproductive rates, polar bears require a high survival rate to maintain population levels (Eberhardt 1985, p. 1,010; Amstrup and Durner 1995, pp. 1,313, 1,319). Survival rates increase up to a certain age, with cubs-

of-the-year having the lowest rates and prime age adults (between 5 and 20 years of age) having survival rates that can exceed 90 percent. Amstrup and Durner (1995, p. 1,319) report that high survival rates (exceeding 90 percent for adult females) are essential to sustain populations.

Polar Bear—Sea Ice Habitat Relationships

Polar bears are distributed throughout the ice-covered waters of the circumpolar Arctic (Stirling 1988, p. 61), and rely on sea ice as their primary habitat (Amstrup 2003, p. 587). Polar bears depend on sea ice for a number of purposes, including as a platform from which to hunt and feed upon seals; as habitat on which to seek mates and breed; as a platform to move to terrestrial maternity denning areas, and sometimes for maternity denning; and as a substrate on which to make long-distance movements (Stirling and Derocher 1993, p. 241). Mauritzen et al. (2003b, p. 123) indicated that habitat use by polar bears during certain seasons may involve a trade-off between selecting habitats with abundant prey availability versus the use of safer retreat habitats (i.e., habitats where polar bears have lower probability of becoming separated from the main body of the pack ice) of higher ice concentrations with less prey. Their findings indicate that polar bear distribution may not be solely a reflection of prey availability, but other factors such as energetic costs or risk may be involved.

Stirling et al. (1993, p. 15) defined seven types of sea ice habitat and classified polar bear use of these ice types based on the presence of bears or bear tracks in order to determine habitat preferences. The seven types of sea ice are: (1) stable fast ice with drifts; (2) stable fast ice without drifts; (3) floe edge ice; (4) moving ice; (5) continuous stable pressure ridges; (6) coastal low level pressure ridges; and (7) fiords and bays. Polar bears were not evenly distributed over these sea ice habitats, but concentrated on the floe ice edge, on stable fast ice with drifts, and on areas of moving ice (Stirling 1990 p. 226; Stirling et al. 1993, p. 18). In another assessment, categories of ice types included pack ice, shore-fast ice, transition zone ice, polynyas, and leads (linear openings or cracks in the ice) (USFWS 1995, p. 9). Pack ice, which consists of annual and multi-year older ice in constant motion due to winds and currents, is the primary summer habitat for polar bears in Alaska. Shore-fast ice (also known as “fast ice”, it is defined by the *Arctic Climate Impact*

Assessment (2005, p. 190) as ice that grows seaward from a coast and remains in place throughout the winter; typically it is stabilized by grounded pressure ridges at its outer edge) is used for feeding on seal pups, for movement, and occasionally for maternity denning. Open water at leads and polynyas attracts seals and other marine mammals and provides preferred hunting habitats during winter and spring. Durner et al. (2004, pp. 18–19; Durner et al. 2007, pp. 17–18) found that polar bears in the Arctic basin prefer sea ice concentrations greater than 50 percent located over the continental shelf with water depths less than 300 m (984 feet (ft)).

Polar bears must move throughout the year to adjust to the changing distribution of sea ice and seals (Stirling 1988, p. 63; USFWS 1995, p. 4). In some areas, such as Hudson Bay and James Bay, polar bears remain on land when the sea ice retreats in the spring and they fast for several months (up to 8 months for pregnant females) before fall freeze-up (Stirling 1988, p. 63; Derocher et al. 2004, p. 163; Amstrup et al. 2007, p. 4). Some populations unconstrained by land masses, such as those in the Barents, Chukchi, and Beaufort Seas, spend each summer on the multi-year ice of the polar basin (Derocher et al. 2004, p. 163; Amstrup et al. 2007, p. 4). In intermediate areas such as the Canadian Arctic, Svalbard, and Franz Josef Land archipelagos, bears stay on the sea ice most of the time, but in some years they may spend up to a few months on land (Mauritzen et al. 2001, p. 1,710). Most populations use terrestrial habitat partially or exclusively for maternity denning; therefore, females must adjust their movements in order to access land at the appropriate time (Stirling 1988, p. 64; Derocher et al. 2004, p. 166).

Sea ice changes between years in response to environmental factors may have consequences for the distribution and productivity of polar bears as well as their prey. In the southern Beaufort Sea, anomalous heavy sea ice conditions in the mid-1970s and mid-1980s (thought to be roughly in phase with a similar variation in runoff from the Mackenzie River) caused significant declines in productivity of ringed seals (Stirling 2002, p. 68). Each event lasted approximately 3 years and caused similar declines in the birth rate of polar bears and survival of subadults, after which reproductive success and survival of both species increased again.

Maternal Denning Habitat

Throughout the species' range, most pregnant female polar bears excavate